

Claims

1. An internal multiband antenna of a radio device having at least a first and a second operating band and comprising a ground plane, radiating element, feed element, feed conductor and a short-circuit conductor, wherein
 - 5 - the radiating element is galvanically isolated from the other conductive parts of the radio device,
 - there is an electromagnetic coupling between the radiating element and feed element to transfer transmitting energy to the field of the radiating element and receiving energy to the field of the feed element,
 - 10 - the feed element is connected through the short-circuit conductor to the ground plane at a short-circuit point to match the antenna,
 - the short-circuit point divides the feed element into a first portion and second portion, and
 - 15 - the first portion of the feed element together with the radiating element and ground plane is arranged to resonate in range of the first operating band of the antenna, and the second portion of the feed element together with the radiating element and ground plane is arranged to resonate in range of the second operating band of the antenna.
2. A multiband antenna according to claim 1, wherein the radiating element, 20 having been installed, follows the contours of the outer surface of the radio device as regards its shape and position.
3. A multiband antenna according to claim 2, the radiating element being a rigid conductive piece belonging to a cover of the radio device.
4. A multiband antenna of a radio device according to claim 3, the radio device 25 comprising two folding parts and said conductive piece, having been installed, constituting a rear portion of the cover of one folding part substantially entirely.
5. A multiband antenna according to claim 3, said conductive piece being an extrusion piece.
6. A multiband antenna according to claim 1, comprising a dielectric antenna 30 plate above the ground plane with a radiating element on one surface of said plate and a feed element on opposing surface thereof.
7. A multiband antenna according to claim 6, said antenna plate being arranged to be attached to an inner surface of a non-conductive cover of the radio device.

8. A multiband antenna according to claim 7, the radiating element being positioned against said inner surface, when the antenna plate has been mounted.
9. A multiband antenna according to claim 2, the radiating element being a conductive layer on an outer surface of the cover of the radio device, and the feed element being a conductive layer on an inner surface of the cover.
10. A multiband antenna according to claim 2, at least one of the radiating element and feed element being located inside the cover of the radio device.
11. A multiband antenna according to claim 1, the feed element being located farther away from the ground plane than the radiating element.
- 10 12. A multiband antenna according to claim 1, the radiating element together with the ground plane being arranged to resonate at a third resonating frequency.
13. A multiband antenna according to claim 12, said third resonating frequency being located in a range of the second operating band of the antenna to widen that band.
- 15 14. A multiband antenna according to claim 12, further comprising at least one tuning element connected to the ground plane, which tuning element has an electromagnetic coupling with the radiating element, to set the third resonating frequency at a desired point on the frequency axis.
15. A multiband antenna according to claim 1, further comprising at least one radiating parasitic element.
- 20 16. A multiband antenna according to claim 15, said parasitic element together with the ground plane being arranged to resonate at a frequency outside the first and second operating bands to provide a third operating band.
17. A multiband antenna according to claim 15, said parasitic element together with the ground plane being arranged to resonate at the first or second operating band to widen that operating band.
- 25 18. A radio device, which includes an internal multiband antenna having at least a first and a second operating band and comprising a ground plane, radiating element, feed element, feed conductor and a short-circuit conductor, wherein
- 30 - the radiating element is galvanically isolated from the other conductive parts of the radio device,

- there is an electromagnetic coupling between the radiating element and feed element to transfer transmitting energy to the field of the radiating element and receiving energy to the field of the feed element,
- the feed element is connected through the short-circuit conductor to the ground plane at a short-circuit point to match the antenna,
- the short-circuit point divides the feed element into a first portion and second portion, and
- the first portion of the feed element together with the radiating element and ground plane is arranged to resonate in a range of the first operating band of the antenna,
- and the second portion of the feed element together with the radiating element and ground plane is arranged to resonate in a range of the second operating band of the antenna.